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ABSTRACT

The decision making process of 16 superintendents in choosing among alternative instructional programs for special education students was studied. The additive and linear additive composition models were investigated for consistency with the decision process of the superintendents. Although the results support the existence of both models, the linear additive composition model was accepted as most consistent with the decision making process of the superintendents. (Author)

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It is known that superintendents often make the final decision in instructional matters. The decision typically involves a choice among alternative curricula or instructional programs. Conceptually, curricular decision making among alternative programs involves a process of weighing and combining information or scores about several attributes to yield an overall judgment about each program relative to the other programs. For example, superintendents interviewed by the experimenter stated that decisions among alternative programs for special education students were based on a comparison of summary statistics on three attributes. Stated in order of importance for decision making these were: 1) program cost per pupil (PC), 2) reading achievement (RA) gain in grade units on the Stanford Achievement Tests, and 3) arithmetic achievement (AA) gain in grade units on the Stanford Achievement Tests.

How do administrators use information about several attributes to make decisions among alternative instructional programs? In particular, how do superintendents weigh and combine information about the program cost, reading achievement, and arithmetic achievement attributes to make choices among instructional programs for special education students? Although there is consensus on the need to answer the general question, there is scant and inconclusive knowledge (Stufflebeam, Foley, Gephart, Guba, Hammond, Merriman, & Provus, 1971). It appears that Tversky's (1967)

statement that very little experimental work had been done to test decision making models among multi-attribute alternatives is still accurate. The experimenter was unable to locate any previous research concerning the process used by superintendents in making decisions among alternative instructional programs.

The development of a decision making model which operationally defines and is consistent with the process used by a superintendent in arriving at a curricular decision would aid school psychologists and a public concerned with accountability in understanding how such decisions are made. An empirically derived model would describe how a superintendent combines his preferences for the scores on each attribute of an alternative to yield an overall judgment about each program relative to the other programs. It was the experimenter's experience that superintendents are frequently unaware of their own decision making process. A decision model would aid the superintendent in understanding the process he actually used in arriving at a decision and help him identify the discrepancies between the process actually used and the ideal process that he is trying to follow. To provide a basis for future decisions, the superintendent may then explicitly accept the decision model or he may attempt to revise his decision making process so as to correspond more closely with his view of what that process ought to be.

There are two possible approaches in developing a model of the process used by superintendents in weighing and combining information about the scores on each attribute of the alternatives (Cronbach & Gleser, 1965). The first approach assumes that the best indicator of a superintendent's preferences is his direct statement of the degree of importance he attaches

to each score on the attributes and how he combines the scores to arrive at an overall judgment of each program. This approach suffers a particular difficulty in that decision makers often overstate their degree of preference for the less important attributes when these statements are compared to their actual decisions (Shepard, 1967).

The second approach avoids the difficulty of overstatement of degree of preference by inferring the preferences and combination process of superintendents from what decisions have been made in a number of instances and then determines if a particular decision model is consistent with those decisions. This approach assumes that the best indicator of a superintendent's preferences is his actual decision. To infer the preferences and the combination process, it may only be necessary to have the superintendent rank several programs in terms of his preference for the overall results of each program.

An inferential approach in which superintendents ranked alternative programs was used in this study to determine the consistency of two decision models, the additive composition model and the linear additive composition model, with the decisions of superintendents. The additive model is more general and the linear additive model is a particular instance of the additive model (Fishburn, 1970).

Both of the models assume that choices among alternative programs are based on the superintendent's preferences for the scores on the attributes of those programs. The additive model assumes that the overall judgment of each program is just the sum of the superintendent's preferences for each score on the attributes of that program. In this additive combination process, a low preference for the score on one attribute of a program can be compensated or made up for by a high

preference for the scores on the other attributes so as to make that program preferred, overall, to other programs which have a more preferred score on that one attribute.

For example, a superintendent may have a low preference for an expensive program. A high preference for a large gain in reading and/or arithmetic achievement, when added to the low preference for the high cost, may make that program preferred to other programs which have a lower cost.

The linear additive model also assumes that the overall judgment of each program is the sum of the superintendent's preferences for each score on the attributes of that program. Further, the linear model assumes that the degree of preference for the scores on the attributes increase or decrease linearly with increases in scores on those attributes. The linear model also assumes that a low preference for the score on one attribute can be compensated for by a high preference for the scores on the other attributes in determining the overall judgment of that program relative to other programs which have a more preferred score on the first attribute.

This study sought to determine if either the additive composition model or the linear additive composition model was consistent with the process used by superintendents in weighing and combining the PC, RA, and AA attributes in decision making among alternative instructional programs for special education students.

Based upon a set of 27 alternative instructional programs formed from all possible combinations of three different scores for the three attributes, the criterion for acceptance of the additive model as consistent with the decision making process of superintendents was two

or fewer incorrect placements of program cards from an additive ordering as defined by conjoint measurement analysis. For those Ss meeting this criterion for the additive model, the linear additive model was also accepted as consistent with the decision making process of any S for whom there were no errors in predicting the order of a set of eight other program cards. The eight cards were formed from all possible combinations of two different scores for each attribute. The two scores were obtained by interpolating the midpoints between the scores in the set of 27 cards.

Since the linear additive model is a particular instance of the additive model, meeting the acceptance criterion for the linear additive model necessarily implies meeting the acceptance criterion for the additive model. Should that situation obtain for any S, the linear additive model will be retained as the model most consistent with the decision process since the linear additive model places more specific constraints upon the number and the structure of possible rankings.

Method

Subjects. The Ss were the 16 suburban superintendents interviewed by the experimenter three months prior to this study. Initially, each S was randomly selected from the same metropolitan area. The Ss were superintendents of public school systems with a school enrollment between 4,000 and 11,000 pupils.

Material. A one page scenario was prepared which described a decision situation among alternative instructional programs for special education students. A set of 27 computer cards was prepared on which were summary statistics of the results of 27 hypothetical one year instructional programs. All cards contained statistics on the PC, RA, and AA attributes, in that order. The set of 27 cards was formed from

all possible combinations of three different scores for each attribute. The three different scores for each attribute were: 1) PC ($100, $300, $500), 2) RA (.4, .8, 1.2 grade units), and 3) AA (.8, 1.0, 1.2 grade units). A set of eight other cards was formed from all possible combinations of two different scores for each attribute. The two scores for each attribute were: 1) PC ($200, $400), 2) RA (.6, 1.0 grade units), and AA (.9, 1.1 grade units).

Procedure. The Ss were individually given the scenario and the sets of cards by the experimenter. After reading the scenario, each S then ranked the set of 27 cards and then the set of eight cards. Each S read the scenario and ranked the cards in his own office during a 30 minute session. The procedure was repeated four days later in each superintendent's office.

The ranking of the 27 cards made by each S during the first day was subjected to conjoint measurement analysis to determine the number of incorrect placements from an additive ordering. The rankings of those Ss meeting the criterion for the additive model were then corrected, if necessary, to perfectly conform to the additive model and a prediction was generated from this ranking for the orderings made by these Ss of the eight cards. The number of errors in predicting the ordering of the eight cards by these Ss was then determined and interpreted as violations from the linear additive model.

Conjoint measurement analysis provided methods for testing composition models using only ordinal information (Krantz & Tversky, 1971). Multiple linear regression was an inappropriate procedure because it assumed an interval level of measurement and also because the results obtained from regression analysis may be altered by an appropriate scale transformation.

The second rankings four days later were to determine the reliability of the initial rankings. A Spearman rank correlation coefficient determined the reliability between the rankings made by each S four days apart.

Results

Ten Ss had no violations of the additive model on the set of 27 cards. These Ss were also perfectly reliable in their orderings. There were no errors in predicting the orderings by these Ss of the eight cards.

Five Ss had less than three violations of the additive model on the set of 27 cards. The reliabilities of these Ss ranged from .94 to 1.00. There were no errors in predicting the orderings by these Ss of the eight cards.

The remaining S exceeded the criterion for the additive model and, necessarily, the linear additive model. This S had a reliability of .89.

Discussion

The results supported both models as consistent with the decision process, but the linear additive model is retained as the model most consistent with the decision making process of superintendents among alternative instructional programs. The degree of preference for the scores on the attributes appears to increase or decrease linearly with increases in scores on those attributes. The overall judgment of each program is the sum of the preferences for the scores on the three attributes.

There were several limitations of this study and implications for future research. First, the results may have depended upon the size of the difference between the scores within each attribute (Tversky, 1969). The size of the difference between scores may have been large enough as

to make the decision process an easy task in which an insufficient number of fine discriminations was required of the Ss. An issue for future research would be to determine if the decision process would be altered by a reduction in the size of the difference between the scores within each attribute.

Second, the linear additive model may not be consistent with the decision process of superintendents among instructional programs for different groups of students such as programs for the mentally retarded or for elementary students. This is an important issue for school psychologists concerned with determining how decisions are made about which instructional programs will be offered to these students. With an explicit understanding of the current decision process, the school psychologist would then have a base from which to discuss with the superintendent whether the current decision process is the procedure that ought to be used in deciding among alternative programs for these students.

Third, the linear additive model may not be consistent with the decision process of superintendents when information about the alternative programs is presented in a different format. The decisions may be affected by the format in which the information is presented. This is an issue of special importance to educational evaluators who have defined their role as providing information for decision making.

An implication of this study for educational practice is that a decision making model and an experimental procedure were developed which could aid school psychologists, school administrators, and a general public concerned with educational accountability in identifying and determining the influence of a superintendent's preferences in decision

making among alternative instructional programs. To aid discussion in instructional matters, it is necessary that both the general public and the superintendent and school pyschologist have an explicit understanding of how decisions are currently made among alternative programs. With this knowledge of the decision process, all the concerned groups would have a common base for future discussion on whether to accept the current process or attempt to revise the process in accordance with particular conceptions of what the decision process ought to be. Should the current process be acceptable, an implication of this study is that a decision model could be placed on a computer to routinely make decisions among alternative instructional programs, perhaps more efficiently than a human.

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